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(54) **APPLICATOR DEVICE FOR APPLYING A MULTI-COMPONENT FLUID**

APPLIKATORVORRICHTUNG ZUM AUFBRINGEN EINER MEHRKOMPONENTEN-FLÜSSIGKEIT
DISPOSITIF APPLICATEUR SERVANT À APPLIQUER UN FLUIDE MULTICOMPOSANT

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WO-A-01/32242 **US-A- 6 113 571**
US-A1- 2002 068 907 **US-A1- 2005 101 963**
US-B1- 6 234 994

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DescriptionBACKGROUND OF THE INVENTIONField of the invention

[0001] The present invention relates to an applicator device for applying a multi-component fluid. In particular, the present invention relates to an applicator device for applying a multi-component tissue glue for surgical purposes.

Related prior art

[0002] Applicator devices for applying a multi-component fluid and, in particular, a multi-component tissue glue are known. One example of such an applicator device is described e.g. in US-A-6 113 573 and in EP-B-0 925 026. This known type of tissue glue applicator device comprises a plurality of substantially cylindrical supply containers in the form of syringes for respectively one component of the fluid to be applied. Each of the supply containers has a front end with an outlet opening, a rear end opposite to the front end, and a slidably displaceable piston arranged within the supply container and having a piston rod extending out of the rear end for operating the piston. The supply containers are connected to terminal ends of the manifold which comprises internal channels extending from the terminal ends to an outlet site of the manifold. Moreover, the known type of tissue glue applicator comprises a holding element for holding the supply containers.

[0003] This kind of applicator device basically works satisfactorily. In order to prevent popping off of the manifold from the supply containers due to clogging of its channels, WO-A-98/10704 and US-B-6 234 994 each disclose a coupling element mechanically attached to the manifold and connected to the holding element. By this known coupling element, the manifold is securely attached to the outlet openings of the supply containers. Other examples for securing the manifold to the supply containers by coupling elements and the like connected to the supply container holding element are disclosed in WO-A-95/31137, WO-A-02/05898, WO-A-03/105933, EP-B-0 689 874, US-A-4 359 049, US-A-5 104 375, US-A-5 290 259, US-A-2003/0 233 067, and DE-U-295 09 729.

[0004] The known tissue glue applicator devices are provided with a catheter extending from the manifold and provided with one or several lumina in fluid communication with the internal channels of the manifold. Depending on the purposes for which the tissue glue applicator is used, the catheter can have a significant length. The longer the catheter, the more torque the catheter applies to the manifold. As it turned out in practice, the known concepts of securing the manifold to the supply containers and the holding elements thereof might not be stable enough when used for manifolds having a rather long

catheter.

[0005] Accordingly, there is a need for an improved construction of an applicator device for applying a multi-component fluid, especially a multi-component tissue glue.

Summary of the invention

[0006] The present invention provides an applicator device for applying a multi-component fluid, especially a multi-component tissue glue, comprising a plurality of substantially cylindrical supply containers for respectively one component of the fluid to be applied, each of said supply containers having a front end with an outlet opening, a rear end opposite to the front end, and a slidably displaceable piston arranged within said supply container and having a piston rod extending out of said rear end for operating the piston, a manifold having terminal ends with a first port for fluid connection with the front ends of said supply containers, said manifold further having internal channels extending from said first ports of said terminal ends to an outlet site, holding elements for holding said supply containers, and a coupling element extending from said holding element and having a connection end connected to said manifold, wherein said connection end of said coupling element is bonded to said manifold.

[0007] The applicator device according to the present invention is provided with a coupling element for mechanically connecting the manifold to the holding element for the supply containers. According to the invention, the coupling element is bonded to the manifold. In one aspect of the present invention, the coupling element is glued to the manifold. As an alternative and according to another embodiment of the present invention, the coupling element is welded to the manifold. Typically, the manifold and the coupling element are made from plastics material of the same kind or a different kind. Accordingly, the glue used is to be adapted to the specific plastics material combination of the manifold and the coupling element. If bonding is performed by welding, in particular an ultrasonic welding connection can be used. If a glue connection is used, curing the glue can be performed by exposing the glue to air or a specific gas or to a specific curing radiation. The glue and welding connection, i.e. the bond between the manifold and the coupling element, should withstand normal operating conditions and should be stable for the lifetime of the applicator device.

[0008] In another aspect of the present invention, the manifold comprises a housing having the terminal ends of the manifold extending from the housing wherein the connecting end of the coupling element at which the coupling element is bonded to the housing of the manifold, is arranged between and bonded to at least two adjacent terminal ends of the manifold. This kind of connection requires only little space. If the manifold comprises two terminal ends for connecting the manifold to the outlet ends of two supply containers, the coupling element is

preferably aligned with the two terminal ends of the manifold.

[0009] The terminal ends of the manifold are provided with first parts for providing fluid communication with the outlet ends of the supply containers. In a preferred embodiment of the present invention, said terminal end of said manifold is provided with a second port capable of selectively being in fluid communication with the channel extending from the first port of said terminal end, and a fluid communication control element selectively operable in a first flow control position for providing a fluid communication between said first port and said second port, and in a second fluid control position for providing a fluid communication between the second port and said outlet site of said manifold. The fluid communication control element used according to this embodiment of the present invention basically is described e.g. in EP-B-0 814 866 as well as in EP-B-0 925 065 and US-A-6 113 571. Operating the applicator devices disclosed in these three references is described in more detail in US-B-6 357 489 and US-B-6 568 434.

[0010] Typically, in order to spray the discharged multi-component fluid, the manifold comprises a further terminal end provided with a hose or the like conduit providing a gaseous substance (medical gas like oxygen) from the terminal end to the outlet site. As referred to above, the outlet site can be arranged at the housing of the manifold or at the one end of a single or multi-lumen catheter attached to the housing and extending therefrom with the one or multi-lumen in fluid communication with the individual channels of the manifold. However, these channels can be separated or combined into one channel within the manifold.

[0011] In another preferred embodiment of the present invention, the manifold is connected by means of Luer lock connectors to the terminal ends provided with the fluid communication control elements as described above. This is advantageous in that a manifold which during intermediate operation of the applicator device might be clogged due to cured tissue glue, can be replaced without the need of disposing the whole applicator device.

[0012] The main aspect of the present invention resides in the stable connection of the holding element to the manifold. According to the invention, this is performed by a glue or weld connection which is much more stable than a known clamping connection of the prior art applicator devices.

Brief description of the drawings

[0013] The present invention will be described in more detail hereinbelow referring to the drawings, in which

Figure 1 shows a plan view of a tissue glue applicator device according to a first embodiment,

Figure 2 shows a corresponding view of the applicator

device according to Figure 1 with a portion of the manifold being detached, and

Figure 3 shows a plan view of a second embodiment of a tissue glue applicator device.

Detailed description of preferred embodiments of the invention

[0014] Fig. 1 shows a plan view of an applicator device 10 for multi-component tissue glues. Applicator device 10 comprises two supply containers provided as commercially available syringes 12 for solutions of proteins, such as fibrinogen, and of fibrinolytic substances, such as thrombin, of a two-component tissue glue. Each syringe 12 comprises a hollow cylindrical syringe body 14 having a front end 16 with an outlet opening 18 and connecting pieces 20, and an open rear end 22. Arranged in each syringe body 14 is a piston 24 in sealing abutment on the inner surface of syringe body 14. Piston 24 is held by a piston rod 26 guided out of syringe body 14 through the rear end 22. The piston rods 26 extend respectively in the longitudinal direction of the syringe bodies 14 (cf. the longitudinal axes 28 of the syringe bodies 14 indicated in the drawings). The free ends 30 of piston rods 26 facing away from piston 24 have annular flanges 32 formed thereon. These annular flanges 32 are mechanically connected to each other by a coupling element 34. Coupling element 34 is formed with two receiving recesses 36 which are laterally open and suited for insertion of the annular flanges 32 thereinto.

[0015] As shown in Figure 1, the two syringe bodies 14 are connected to each other by a clip folding means 38 (hereinbelow referred to as a holding element). Holding element 38 comprised two C-shaped holding clamps 40 of which the openings 42 are facing away from each other and which are connected to each other by their middle portions ("back, portions"). The openings 42 are oriented in the direction of the extension of that plane (here coinciding with the plane of Figure 1) in which the longitudinal axes 28 of the syringe bodies 14 are arranged. The clamps 40 are provided with two undergrip-projections 44. (In the view of Figure 1, only one projection 44 is visible.) These projections 44 extend in mutually opposite directions, being arranged at a rotational displacement of 90° relatively to the two clamps 40 or respectively their openings 42. Thus, the two projections 44 respectively project at right angles from the plane (of Figure 1) in which the longitudinal axes 28 of the syringe bodies 14 are held by the holding element 38, or respectively in which the longitudinal axes of the clamps 40 extend, coinciding with the longitudinal axes 28 of the syringe bodies 14. This means that the projections 44 protrude in opposite directions along the axis of symmetry of the twin clamp arrangement.

[0016] The holding clamps 40 may extend by about 180° around the syringe bodies 14 and may enclose the syringe bodies 14 with a clamping force. The holding el-

element 38 receives laterally protruding flanges 46 on the rear ends 22 of the syringe bodies 14, thus axially securing the syringe bodies 14. The axial dimension of holding element 38 and especially of the holding clamps 40 is such that the scale markings arranged externally on the syringe bodies 14 are left unobstructed and are not covered by the holding element 38.

[0017] As evident from Figure 1, the slightly conical connecting pieces 20 on the front ends 16 of the syringe bodies 14 are respectively connected to a fluid control device 48. Each fluid control device 48 is provided with a connector 50 receiving the cylindrical connecting piece 20 of a syringe both 14. Each fluid control device 48 is provided with an outlet connecting piece 52 opposite to connector 50. Further, each fluid control device 48 is provided with a receiving adaptor 54 comprising a fluid conduit member 56. The receiving adaptor 54 is configured for insertion of a medicinal vessel thereinto, with the fluid conduit member, formed as a puncturing needle, penetrating the rubber closure plug of the vessel and extending into the interior of the vessel. Each fluid control device 48 has a flow control member (shown in Figure 1 at 49) rotatably supported therein. This flow control member can be rotated from outside, which is performed particularly by rotating the adaptor 54. By rotating the flow control member, the flow control member can be moved from a first fluid control position wherein a fluid path exists between a syringe body 14 and the medicinal vessel, into a second fluid control position wherein the syringe body 14 is in fluid connection with the outlet connecting piece 52 of fluid control device 48. The structure and the function of each fluid control device 48 and their use for loading the syringes 12 of the applicator device 10 with the fluid components as well as for displacing them are explained in greater detail in US-A-6 113 571, EP-B-0 925 026, EP-B-0 814 866, US-B-6 357 489 and US-B-6 568 434.

[0018] The outlet connecting pieces 52 of fluid control device 48 have the connectors 58 of a connecting headpiece 60 mounted thereon. The connecting headpiece 60 is formed with channels 62 extending therethrough for connecting said connectors 58 to the outlet end 64 of connecting headpiece 60. Further, the connecting headpiece 60 is formed with an additional channel 66 extending therethrough and having a hose 68 for a medicinal gas, e.g. O₂, with an e.g. Luer lock connector 69 for connecting a source thereto. Also channel 66 extends to the outlet end 64 of connecting headpiece 60. On the outlet end 64, the connecting headpiece 60 is joined by a flexible three-lumina catheter 70 having an outlet site 71 at its free end, its three lumina being flush the inner channels 62 and 66 of connecting headpiece 60 at the outlet end 64 of headpiece 60. The fluid control devices 48 and the connecting headpiece form the manifold 72 according to a first embodiment of the applicator device 10.

[0019] A further typical feature of the applicator 10 according to Figures 1 and 2 is a coupling element 74 preferably integrally connected to the holding element 38

and, in particular, to its holding clamps 40. The coupling element 74 extends between the two syringes 12 which preferably contact the coupling element 74 at opposite sides for guiding and abutment purposes. The coupling element 74 is provided with a free end 76 forming a connection end at the fluid control devices 48. In this embodiment, the connection end 76 is glued (see reference numeral 78 in Figures 1 and 2) to the connectors 50 of the fluid control devices 48. However, this type of connection is not the only possible bonding connection between the coupling element 74 and the manifold 72. As an alternative to gluing, also welding the connection end 76 to the manifold 72 is possible.

[0020] The strong bonding connection by gluing or welding provides additional stiffness to the overall applicator device 10, which is useful in particular in cases where the manifold 72 is provided with a rather long catheter 72, e.g. for endoscopic surgery purposes.

[0021] As also shown in Figure 1, the connecting head piece 60 of the manifold 72 is connected to the fluid control devices 48 by means of Luer lock connectors 80. This makes it possible, in case of a potential clogging, to replace the connecting head piece 72 and catheter 70 by a new manifold and catheter.

[0022] Figure 3 shows an alternative embodiment of a tissue glue applicator 10' which basically is identical to the applicator device 10 of Figures 1 and 2, except for the manifold 72 which comprises the connecting head piece and catheter 70 only, i.e. without the fluid control devices 48 shown in Figures 1 and 2. The bonding connection between the coupling element 74 and the manifold 72 is the same, preferably using a glue or a welding connection. In the embodiment of Figure 3, the connection end 76 of the coupling element 74 is bonded, i.e. glued or welded, to the terminal ends 58 of the connecting head piece 60. It is to be noted that in Figure 3 the same reference numerals are used for elements of the applicator device 10' which, regarding their structure and function, are identical or similar to corresponding elements of the applicator device 10 shown in Figures 1 and 2.

[0023] Although the invention has been described and illustrated with reference to specific illustrative embodiments thereof, it is not intended that the invention be limited to those illustrative embodiments. Those skilled in the art will recognize that variations and modifications can be made without departing from the true scope of the invention as defined by the claims that follow. It is therefore intended to include within the invention all such variations and modifications as fall within the scope of the appended claims.

Claims

1. An applicator device for applying a multi-component fluid, especially a multi-component tissue glue, comprising

- a plurality of substantially cylindrical supply containers (12) for respectively one component of the fluid to be applied, each of said supply containers (12) having a front end (16) with an outlet opening (18), a rear end (22) opposite to the front end (16), and a slidably displaceable piston (24) arranged within said supply container (12) and having a piston rod (26) extending out of said rear end (22) for operating the piston (24),
 - a manifold (72) having terminal ends (50,58) with a first port for fluid connection with the front ends (16) of said supply containers (12), said manifold (72) further having internal channels (62) extending from said first ports of said terminal ends (50,58) to an outlet site,
 - a holding element (38) for holding said supply containers (12), and
 - a coupling element (74) extending from said holding element (38) and having a connection end (76) connected to said manifold (72),
- characterized in that** said connection end (76) of said coupling element (74) is bonded to said manifold (72).
2. The applicator device according to claim 1, wherein said manifold (72) comprises a housing (73) having its terminal ends (50,58) extending therefrom and wherein said connection end (76) of said coupling element (74) is arranged between and bonded to at least two adjacent terminal ends (50,58) of said manifold (72).
 3. The applicator device according to claim 1 or 2, wherein each terminal end (50,58) of said manifold (72) is provided with a second port capable of selectively being in fluid communication with the channel extending from the first port of said terminal end (50,58), and a fluid communication control element (49) selectively operable in a first flow control position for providing a fluid connection between said first port and said second port and in a second flow control position for providing a fluid communication between the second port and said outlet site (71) of said manifold.
 4. The applicator device according to any one of claims 1 to 3, wherein said manifold (72) comprises a further terminal end (69) and a further internal channel (66) extending from said further terminal end (69) to said outlet site (71) for supplying a gaseous substance from said further terminal end (69) to the outlet site (71).
 5. The applicator device according to any one of claims 2 to 4, wherein said connection end (76) of said coupling element (74) is glued to said manifold (72).

6. The applicator device according to any one of claims 2 to 4, wherein said connection end (76) of said coupling element (74) is welded to said manifold (72).
7. The applicator device according to any one of claims 1 to 6, wherein said coupling element (74) is integrally formed with said holding element (38).
8. The applicator device according to any one of claims 1 to 7, wherein said outlet site (71) is provided at one end of a single of multi-lumina catheter (70) extending from said manifold (72).

15 Patentansprüche

1. Applikatorvorrichtung zum Aufbringen eines Mehrkomponentenfluids, insbesondere eines Mehrkomponenten-Gewebeklebers, mit:
 - mehreren, im Wesentlichen zylindrischen Vorratsbehältern (12) für jeweils eine Komponente des aufzubringenden Fluids, wobei jeder der Vorratsbehälter (12) ein vorderes Ende (16) mit einer Auslassöffnung (18), ein dem vorderen Ende (16) entgegengesetztes hinteres Ende (22) und einen gleitend verschiebbaren Kolben (24) aufweist, der in dem Vorratsbehälter (12) angeordnet ist und eine Kolbenstange (26) aufweist, welche sich zum Betätigen des Kolbens (24) aus dem hinteren Ende (22) erstreckt,
 - einem Sammler (72) mit Anschlussenden (50, 58), die einen ersten Port zur Fluidverbindung mit den vorderen Enden (16) der Vorratsbehälter (12) aufweisen, wobei der Sammler (72) ferner innere Kanäle (62) aufweist, welche sich von den ersten Ports der Anschlussenden (50, 58) zu einer Auslassstelle erstrecken,
 - einem Halteelement (38) zum Halten der Vorratsbehälter (12), und
 - einem sich von dem Halteelement (38) erstreckenden Verbindungselement (74) mit einem mit dem Sammler (72) verbundenen Verbindungsende (76),

dadurch gekennzeichnet, dass das Verbindungsende (76) des Verbindungselements (74) mit dem Sammler (72) verbondet ist.
2. Applikatorvorrichtung nach Anspruch 1, bei dem der Sammler (72) ein Gehäuse (73) aufweist, von welchem sich die Anschlussenden (50, 58) erstrecken, und wobei das Verbindungsende (76) des Verbindungselements (74) zwischen mindestens zwei benachbarten Anschlussenden (50, 58) des Sammlers (72) angeordnet und mit diesen verbondet ist.
3. Applikatorvorrichtung nach Anspruch 1 oder 2, bei

dem jedes Anschlussende (50, 58) des Sammlers (72) mit einem zweiten Port versehen ist, welcher derart ausgebildet ist, dass er selektiv in Fluidverbindung mit dem sich von dem ersten Port des Anschlussendes (50, 58) erstreckenden Kanal stehen kann, und mit einem Fluidverbindungssteuerelement (49), das selektiv in eine erste Strömungssteuerungsposition zum Herstellen einer Fluidverbindung zwischen dem ersten Port und dem zweiten Port und in eine zweite Strömungssteuerungsposition bringbar ist, um die Fluidverbindung zwischen dem zweiten Port und der Auslassstelle (71) des Sammlers herzustellen.

4. Applikatorvorrichtung nach einem der Ansprüche 1 bis 3, bei welcher der Sammler (72) ein weiteres Anschlussende (69) und einen weiteren inneren Kanal (66) aufweist, welcher sich von dem weiteren Anschlussende (69) zu der Auslassstelle (71) erstreckt, um eine gasförmige Substanz von dem weiteren Anschlussende (69) zu der Auslassstelle (71) zu leiten.
5. Applikatorvorrichtung nach einem der Ansprüche 2 bis 4, bei welcher das Verbindungsende (76) des Verbindungselements (74) mit dem Sammler (72) verklebt ist.
6. Applikatorvorrichtung nach einem der Ansprüche 2 bis 4, bei welcher das Verbindungsende (76) des Verbindungselements (74) mit dem Sammler (72) verschweißt ist.
7. Applikatorvorrichtung nach einem der Ansprüche 1 bis 6, bei welcher das Verbindungselement (74) einstückig mit dem Halteelement (38) ausgebildet ist.
8. Applikatorvorrichtung nach einem der Ansprüche 1 bis 7, bei welcher die Auslassstelle (71) an einem Ende eines sich von dem Sammler (72) erstreckenden einzelnen Katheters (70) mit mehreren Lumina vorgesehen ist.

Revendications

1. Dispositif applicateur servant à appliquer un fluide multicomposant, particulièrement un adhésif de tissu multicomposant, comprenant
 - plusieurs réservoirs (12) sensiblement cylindriques, respectivement pour un composant du fluide à appliquer, chacun des réservoirs (12) comprenant une extrémité avant (16) avec une ouverture de sortie (18), une extrémité arrière (22) opposée à l'extrémité avant (16), et un piston (24) déplaçable par glissement disposé dans le réservoir (12) et comprenant une tige de piston (26) s'étendant hors de l'extrémité arrière

(22) pour opérer le piston (24),
 - un collecteur (72) avec des extrémités de raccordement (50, 58) comprenant un premier port pour la communication fluide avec les extrémités avants (16) des réservoirs (12), le collecteur (72) comprenant en outre des conduits internes (62) s'étendant des premiers ports des extrémités de raccordement (50, 58) vers une point de sortie,
 - un élément de support (38) pour supporter les réservoirs (12), et
 - un élément de couplage (74) s'étendant de l'élément de support (38) et comprenant une extrémité de connexion (76) connectée au collecteur (72),

caractérisé en ce que ladite extrémité de connexion (76) dudit élément de couplage (74) est reliée audit collecteur (72).

2. Dispositif applicateur selon la revendication 1, dans lequel ledit collecteur (72) comprend un boîtier (73) duquel s'étendent lesdites extrémités de raccordement (50, 58), et dans lequel l'extrémité de connexion (76) dudit élément de couplage (74) est disposée entre et liée à au moins deux extrémités de raccordement (50, 58) adjacentes dudit collecteur (72).
3. Dispositif applicateur selon la revendication 1 ou 2, dans lequel chaque extrémité (50, 58) dudit collecteur (72) est prévue d'un deuxième port apte à être sélectivement en communication fluide avec le conduit s'étendant dudit premier port de ladite extrémité de raccordement (50, 58), et d'un élément de commande de la communication fluide (49) sélectivement opérable dans une première position de commande d'écoulement pour établir une connexion fluide entre le premier port et le deuxième port, et dans une deuxième position de commande de l'écoulement pour établir une communication fluide entre le deuxième port et le point de sortie (71) dudit collecteur.

4. Dispositif applicateur selon une quelconque des revendications 1 à 3, dans lequel ledit collecteur (72) comprend une autre extrémité de raccordement (69) et un autre conduit interne (66) s'étendant de ladite autre extrémité de raccordement (69) jusqu'au point de sortie (71) pour alimenter une substance gazeuse de ladite autre extrémité de raccordement (69) à ledit point de sortie (71).
5. Dispositif applicateur selon une quelconque des revendications 2 à 4, dans lequel l'extrémité (76) dudit élément de couplage (74) est collée audit collecteur (72).

6. Dispositif applicateur selon une quelconque des revendications 2 à 4, dans lequel l'extrémité de connexion (76) dudit élément de couplage (74) est soudeée audit collecteur (72).

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7. Dispositif applicateur selon une quelconque des revendications 1 à 6, dans lequel l'élément de couplage (74) est formé d'un seul tenant avec l'élément de support (38).

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8. Dispositif applicateur selon une quelconque des revendications 1 à 7, dans lequel le point de sortie (71) est prévu à une extrémité d'un seul cathéter à multiples lumières (70) s'étendant dudit collecteur (72).

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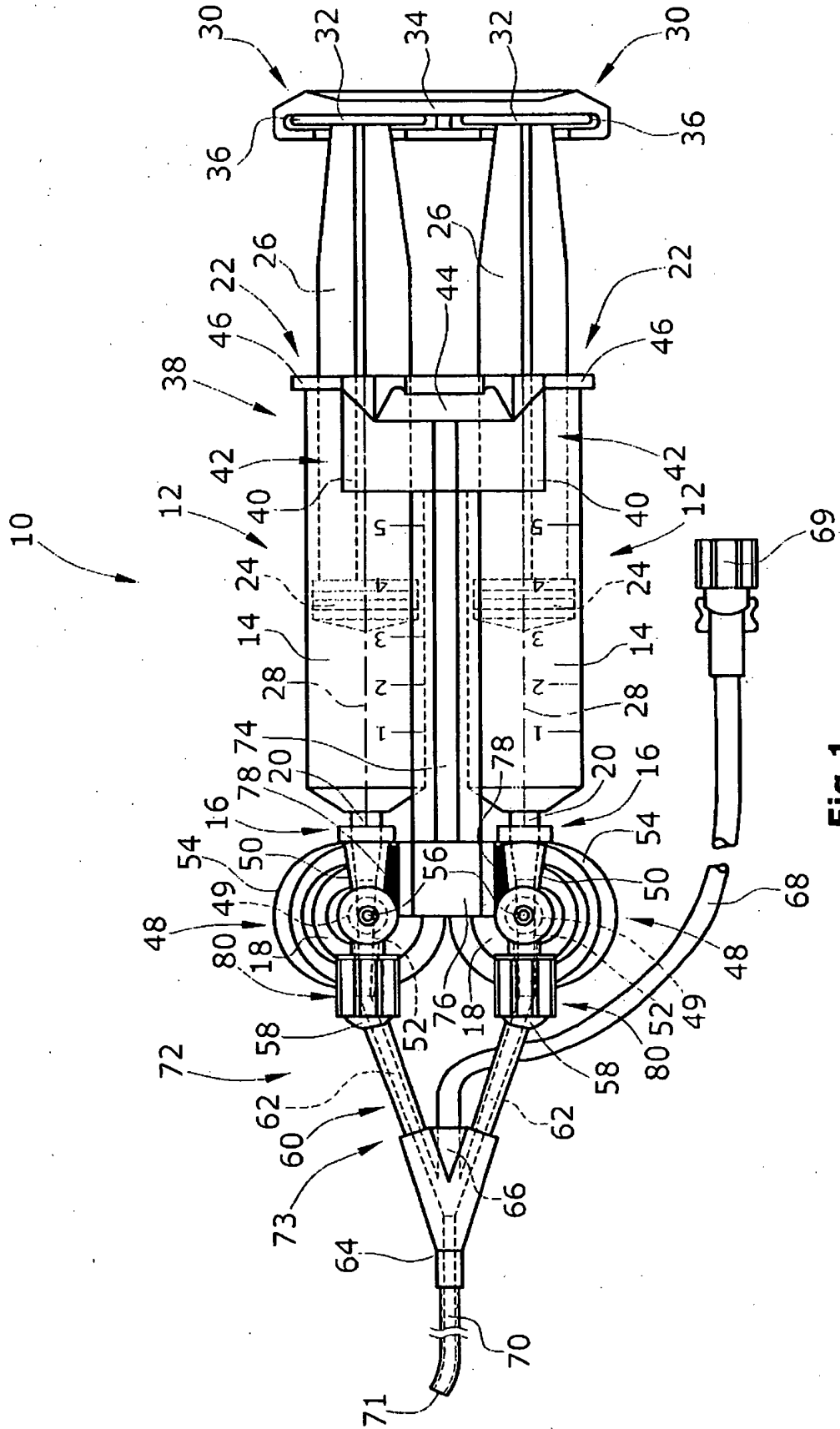


Fig. 1

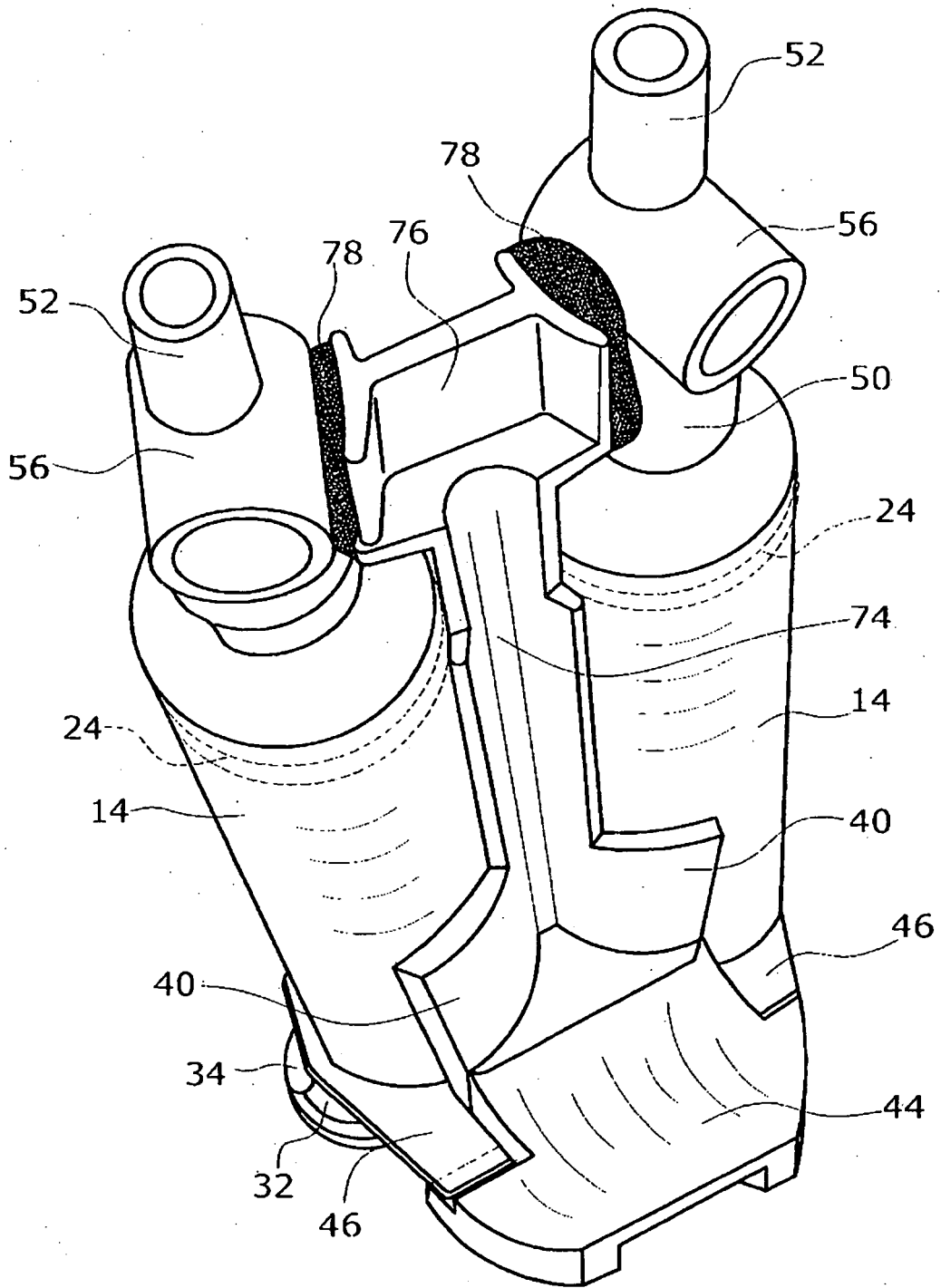


Fig.2

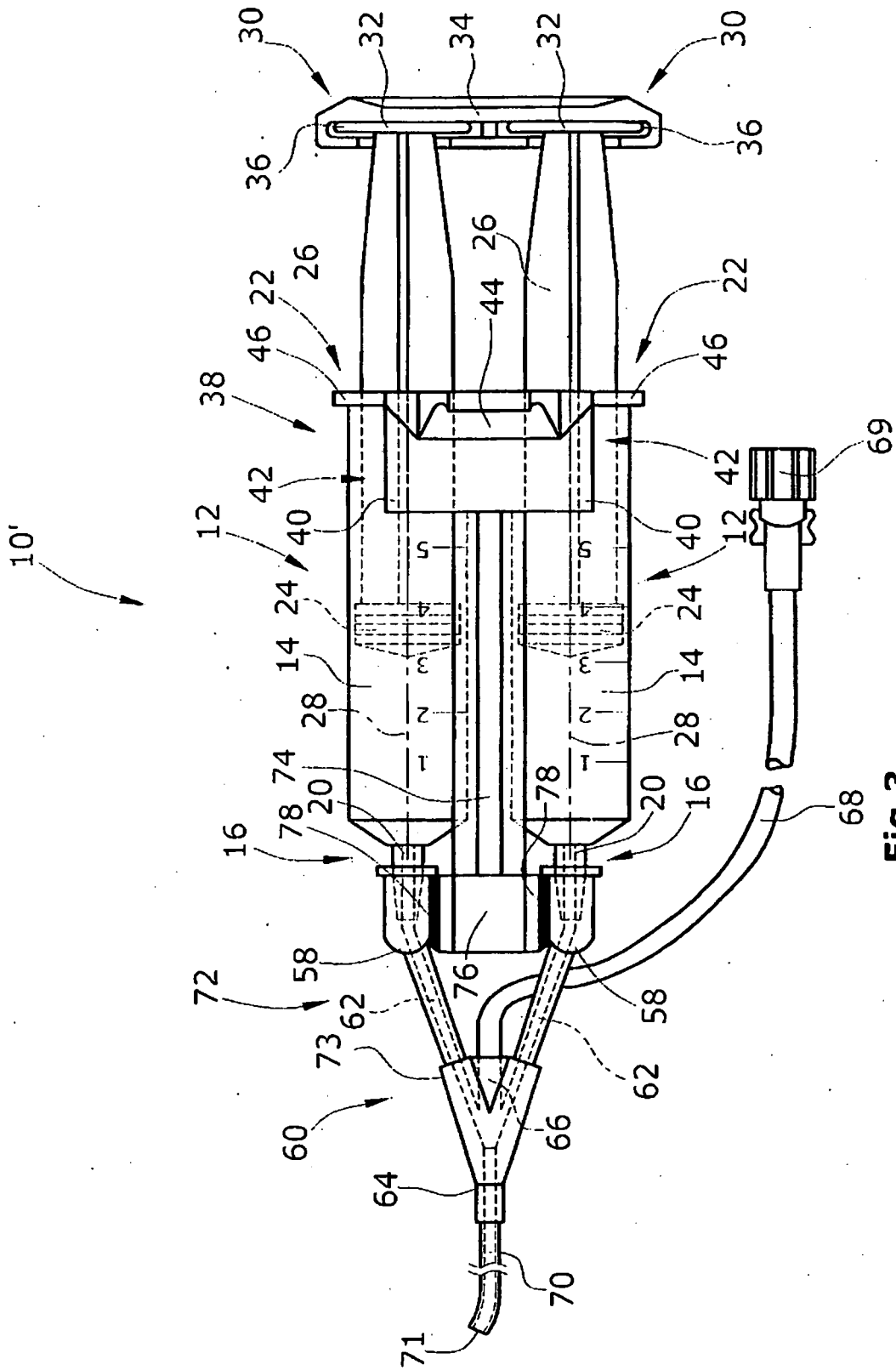


Fig.3

REFERENCES CITED IN THE DESCRIPTION

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